International Journal of Agricultural Science and Research (IJASR)
ISSN(P): 2250-0057; ISSN(E): 2321-0087
Vol. 7, Issue 3, Jun 2017, 339-342

TRANS STELLAR
•Journal Publications •Research Consultancy

EFFECT OF DIETARY INCLUSION OF SOLVENT EXTRACTED AND DETOXIFIED KARANJ (*PONGAMIA GLABRA VENT*) CAKE ON FEED INTAKE, SERUM BIOCHEMICAL PARAMETERS AND ECONOMICS

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ABSTRACT

Shortage of conventional feed ingredients makes it imperative to search for alternate feed resources for reducing the cost of chicken feed. A study was conducted to observe the effect of dietary incorporation of alkali (2% NaOH, w/w) processed solvent extracted karanj cake (SKC) supplemented with or without protease and liver tonic. Two hundred and sixteen commercial layer chickens (Lohmann) at the age of 41 weeks were procured, leg banded, weighed individually and distributed in a completely randomized design (CRD) into 9 treatments, which were further replicated in 6 and fed on diet containing soybean meal, and those of test groups were fed diets containing SKC and NaOH treated SKC partially replacing soybean meal. The FCR (Feed intake/dozen eggs) was signed (P<0.05) higher in the raw SKC and NaOH treated SKC supplemented with liver tonic. This solvent extracted karanj cake could be incorporated after alkali (2% NaOH, w/w) processing at an enhanced level of 10%, replacing soybean meal nitrogen, in the commercial layers without deleterious effects in comparison to control on the feed intake, FCR (Feed intake/dozen eggs), serum biochemical parameters and economics.

KEYWORDS: White Leghorn Layer Chicken, Karanj Cake, FCR (Feed Intake/Egg Mass) & Serum Biochemical Parameters and Economics

Received: Feb 26, 2017; **Accepted:** Mar 24, 2017; **Published:** May 31, 2017; **Paper Id.:** IJASRJUN201743

Original Article

INTRODUCTION

Agro-forest based industrial byproducts are gaining momentum, as alternative feed resources for the poultry industry (Haque *et al*., 1996) due to chronic shortage of protein and energy rich feeds in India and other South East Asian countries. Karanj cake is rich in protein and was advocated for incorporation in various types of poultry rations at very low levels, partially replacing soybean meal (Krishna Daida, 2013). However, the feeding value of the carnage cake on poultry is limited due to toxic principles karanjin, a form of lavonoid, tannins, trypsin inhibitor (Natanam et al. 1989). A recent study revealed that alkali treatment with NaOH or CA $(OH)_2$ of carnage cake reduced the karanjin content substantially (Panda *et al*., 2006). The present study was, therefore, conducted to see the effect of dietary incorporation of solvent extracted karanj cake and detoxified karanj cake on feed intake, FCR (Feed intake/dozen eggs), serum biochemical parameters, and economics in layer chicken.

MATERIALS AND METHODS

A total of 216 commercial layers (Lohmann) at the age of 45 weeks were procured, leg banded and weighed individually. Six replicates were allocated to each of the treatments (9), employing four birds/ replicate. The experiment was conducted in 3 laying periods, viz. first period (45- 48 weeks), second period (49-52 weeks)

and third period (53 -56 weeks). Efforts were made to detoxify karanj cake by chemical method such as acid treatment in the present study. At a concentration of 2% (w/w) NaOH was effective in reducing the karanjin concentration of solvent extracted karanj cake (SKC). The level of nutrients in all the diets was maintained similarly (isocaloric and isonitrogenous).

Feed consumption of each replicate was recorded at 28 day intervals, on a cumulative basis and the feed consumption / bird / day was arriving at the end of the experiment. On the last day of each period, i.e. 48th, 52nd, 56th weeks blood from one representative bird from each replicate was collected for estimation of Serum Analysis. Total Protein (TP245), Cholesterol (CB12P01K), Alkaline phosphates (75DP200-20, 75DP200-50) by using a spectrophotometer with commercially available kits. The sale price of the egg was taken as Rs. 2.807 per each egg.

RESULTS AND DISCUSSIONS

The feed consumption was not significantly ($P>0.05$) influenced during the cumulative feed consumption at 10% level of processed or unprocessed SKC supplementation with or without protease (4000 U/kg) or liver tonic (0.1%). The FCR (Feed intake/dozen eggs) was signed ($P<0.05$) higher in the raw SKC and NaOH treated SKC supplemented with liver tonic. Raju *et al*. (2014) reported that, feed intake was significant ($P<0.01$) decreased in commercial layers fed diets at 9% and 12% level of SKC during 50 – 61 weeks of age. Krishna Daida (2013) reported that, the normal values were recorded for feed consumption at the inclusion of SKC up to 6% level and Verma *et al*. (1984) reported poor feed consumption in layers given 10% karanj cake in the diet.

The serum biochemical profile were comparable among all the dietary groups with or without supplementation of protease and liver tonic, except alkaline phosphatase activity (lower in SKC and detoxified SKC fed groups) during 45 - 56 weeks. Similar findings were observed by Raju *et al*. (2014) that, serum biochemical profile was not different among the various dietary groups by the inclusion of SKC, except alkaline phosphatase activity.

The sale amount of eggs (Rs.) per bird on the control diet, control supplementation with protease and liver tonic was 246.7, 247.1 and 247.1 per bird, SKC, SKC supplementation with protease and liver tonic was 234.2, 242.0 and 246.4 per bird, NaOH treated SKC, NaOH treated SKC supplementation with protease and liver tonic was 245.7, 246.5 and 246.9 per bird, respectively.

The returns over feed cost (Rs.) on the control diet, control supplementation with protease and liver tonic was 52.69, 54.98 and 54.91 per bird, SKC, SKC supplementation with protease and liver tonic was 55.72, 60.96 and 66.96 per bird, NaOH treated SKC, NaOH treated SKC supplementation with protease and liver tonic was 61.09, 65.02 and 57.72 per bird, respectively.

Similar findings were observed by Raju *et al.* (2012) indicated that IPA treated SKC increased returns over feed cost than alkali and acid treated SKC diet. Krishna Daida (2013) reported that, all the carnage cakes diets resulted in a loss on feed cost over control, but detoxification of SKC with NaOH (2%, w/w) or 1% NaOH (1%, w/w) & HCl (1%, w/v) had no added advantage of the broiler performance. The returns over feed cost were decreased with increased levels of processed or unprocessed karanj cake in the broiler diets.

CONCLUSIONS

Solvent extracted karanj cake be incorporated after alkali (2% NaOH w/w) processing at an enhanced level of

10%, replacing soybean meal protein in the commercial layer chicken diet. By supplementation of protease and liver tonic in processed or unprocessed SKC diet partially sparing costly and scarce conventional oil cake, supported optimum nutritional performance and economic importance in commercial layer chickens.

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APPENDICES

Table 1: Feed Consumption, Feed Intake per Dozen Eggs and Serum Biochemical Profile in White Leghorn Layers Fed Detoxified Karanj Cake during 45 - 56 Weeks of Age

Treatment	SKC Level (%)	Feed Consumption (G/Day)	FCR (Feed Intake/Dozen eggs)	Protein (g/100ml)	Cholesterol (mg/100ml)	Alkaline Phosphatase (IU/liter)
Control	-	**102.3**	**2.232**	**3.973**	**119.8**	**178.4^{ab}**
Control + Protease (4000U/kg)	-	**101.3**	**2.314**	**3.890**	**144.9**	**207.9^{a}**
Control + Liver Tonic (0.1%)	-	**100.9**	**2.233**	**3.368**	**124.8**	**172.6^{ab}**
SKC	10	**99.40**	**2.405**	**3.436**	**102.4**	**127.1^{b}**
SKC +Protease (4000U/kg)	10	**100.8**	**2.325**	**3.883**	**104.6**	**111.3^{b}**
SKC+ Liver Tonic (0.1%)	10	**99.50**	**2.318**	**3.795**	**135.7**	**139.0^{b}**
NaOH treated SKC	10	**101.4**	**2.250**	**3.761**	**135.7**	**135.8^{b}**
NaOH treated SKC+ Protease (4000U/kg)	10	**101.1**	**2.272**	**3.976**	**133.9**	**110.9^{b}**
NaOH treated SKC + Liver Tonic (0.1%)	10	**103.3**	**2.308**	**3.733**	**141.3**	**125.6^{b}**
n		**6**	**6**	**6**	**6**	**6**
P value		**0.516**	**0.917**	**0.684**	**0.234**	**0.027**
SEM		**0.515**	**0.028**	**0.084**	**4.492**	**7.861**

SKC – Solvent extracted karanj cake, Means bearing atleast one common superscript in a column do not differ significantly ($P<0.05$)

P_1 - period 1 (45-48 weeks), P_2 – period 2 (49-52 weeks), P_3 – period 3 (53-56weeks)

Table 2: Cost of Feeding of White Leghorn Layers, Returns Over Feed Cost and the difference of Returns on Karanj Diets Over Control Diet during 45- 56 weeks of Age

Treatment	Cum. Feed Consumption (kg)	Cum. Feeding Cost (Rs./Bird)	Egg sale Amount* (Rs./Bird)	Returns Over Feed Cost (Rs./Bird)	Gain/Loss Over Control (Rs./Bird)
Control	8.497	194.0	246.7	52.69	-
Control + Protease (4000U/kg)	8.409	192.1	247.1	54.98	2.29
Control + Liver Tonic (0.1%)	8.381	192.2	247.1	54.91	2.22
SKC	8.249	178.5	234.2	55.72	3.03
SKC +Protease (4000U/kg)	8.366	181.1	242.0	60.96	8.27
SKC+ Liver Tonic (0.1%)	8.258	179.5	246.4	66.96	14.3
NaOH treated SKC	8.421	184.7	245.7	61.09	8.4
NaOH treated SKC+ Protease (4000U/kg)	8.395	181.5	246.5	65.02	12.3
NaOH treated SKC + Liver Tonic (0.1%)	8.580	189.1	246.9	57.72	5.03

SKC –Solvent extracted karanj cake

*The sale price of egg was taken as Rs. 2.807 per each egg.

Table 3: Economics of Feeding Two Type *Karanj* Cakes with Supplementation Enzyme and Livertonic

Types of Karanj Cake	Enzyme/Liver Tonic	Cost of Feeding (Rs./Bird)	Egg Sale Cost (Rs./Bird)	Returns Over Feed Cost (Rs./Bird)
Control		192.8	247.0	54.19
SKC (10%)		179.7	240.9	61.44
NaOH treated SKC (10%)		185.1	246.4	61.21
	Without enzyme / liver tonic	185.7	242.2	56.50
	Protease(4000 U/kg)	184.9	245.2	60.32
	Liver tonic (0.1%)	187.0	246.8	59.86